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Double Optical Gating: an easy method for generating isolated attosecond pulses[1]

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Isolated attosecond pulses are powerful tools for exploring electron dynamics in matter. So far, such extreme ultraviolet pulses have only been generated using high power, few-cycle lasers, which are very difficult to construct and operate. We propose and demonstrate a technique called double optical gating for generating isolated attosecond pulses with lasers pulses as long as 28 fs that was directly from a chirped pulse amplifier. These XUV pulses, generated from argon gas, are measured to be 148 as by reconstructing the streaked photoelectron spectrograms. This new gating scheme, with a relaxed requirement on laser pulse duration, makes attophysics more accessible to many laboratories that are capable of producing such multi-cycle laser pulses. The double optical gating also works with sub-10 fs driving lasers, which generated supercontinuum spectrum extends from 28 eV to 620eV including the "water window" region and supports single 16 as pulses, below one atomic unit of time (24 as). We have used the isolated 140 attosecond pulses in several applications, which include a demonstration that the two-electron dynamics in helium could be observed and controlled.

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